

**US View on the  
Technological  
Convergence Between the  
Internet of Things and  
Cloud Computing  
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# Topics

- Evolution of the Internet
- Definitions
- The Cloud and IoT
- A View from the United States
- The Future Demand
- IoT Structure
- Challenges
- Policy Issues
- Conclusion

# Evolution of the Internet

- Internet 1.0
  - linking and computers and sharing data
- Internet 2.0
  - sharing content where applications like Facebook, YouTube, and Twitter are becoming the hub of the Internet activity
- Internet 3.0
  - Total transformation of sensor networks, connectivity, smart grids, environmental sustainability, e-accessibility, and many other societal benefits

# Today and Tomorrow

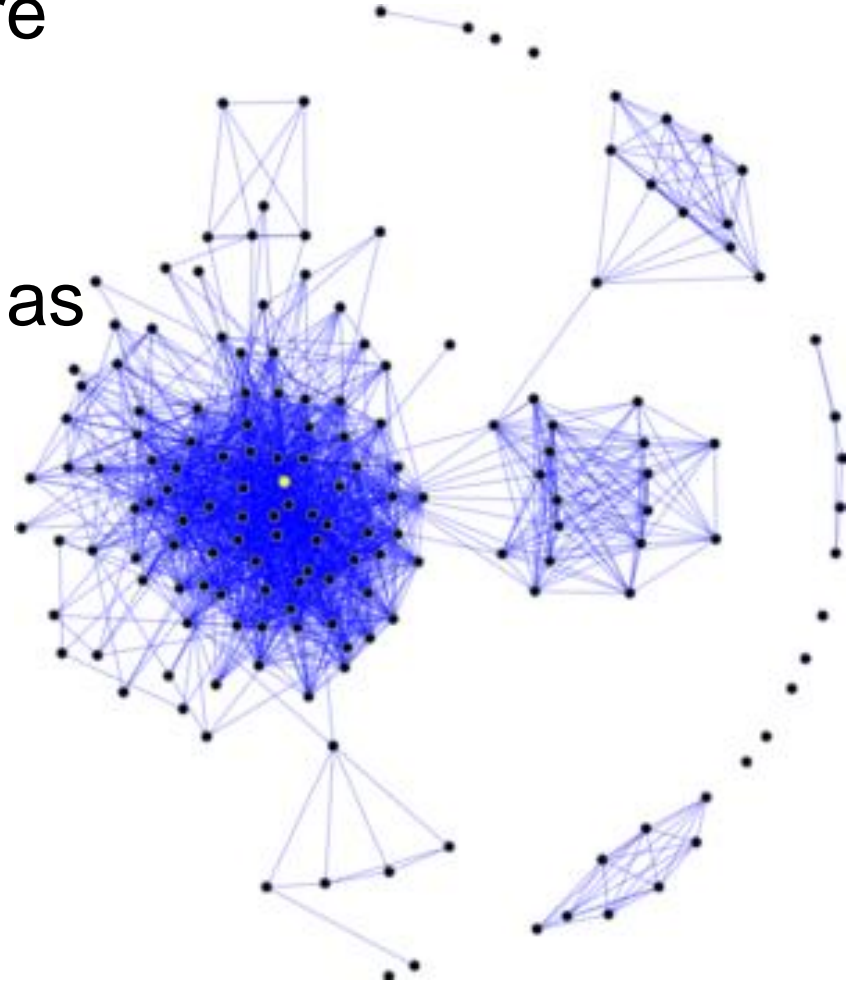
- Today, the Internet connects about 1.6 billion PCs to the Web
- Already a huge demand for ubiquitous wireless
- Beginning to see the power of connecting thousands of inexpensive sensors or wireless identification tags to the Internet

# Definition: Cloud Computing

- Wall St Journal credits Google CEO Eric Schmidt for the first use of the term “cloud computing” in 2006
- Broadly – it describes information stored and processed on computers remotely and brought back to your desktop

# Cloud Computing

- No two clouds are alike
- Will be as transformational as E-Business
- Lots of jargon



# Definition: Internet of Things (IoT)

- ITU defines IoT as the next step in “always on” computing promising a world of networked and interconnected devices
- Mobile commerce, devices, things, people, and machines will all be part of our future Internet of connectivity
- Potential for many societal benefits
  - IoT could help emergency responders respond to disasters, reduce life-threatening errors in hospitals, and even help farmers grow r crops and manage herds
- Tags, devices, and services will require different levels of information and will contain and protect that information in different ways

# The Cloud and IoT

- The Internet of Things and Cloud Computing are not *converging*
- The Cloud is the enabler of the Internet of Things (IoT)
  - You could have one without the other
- The Cloud and IoT are best considered as a continuum of Internet connectivity

# A View from the United States

- The IoT is by definition and should be considered global in context even while recognizing that legislative and regulatory inquiries must be considered locally, regionally, nationally and internationally



# The Future Demand

- In ten years, 100 billion devices will be connected to the Internet
  - Likely that most Americans will own at least 50 “Internet-enabled” items
  - Most items will be “tagged” in some fashion, and readable
  - Less likely that these items will be directly linked to the Internet
- By 2020, 80% of all computing and storage done worldwide will happen in the cloud
- Today’s Internet is not capable of connecting hundreds of billions of devices

# IoT Structure

- One prerequisite for the IoT is widespread deployment of IPv6
  - next generation of the Internet Protocol, which will provide billions of billions of unique Internet addresses
- Promise of an Interoperable “network of networks”
- or, will the IoT consist of sub networks using proprietary standards which will connect to the Internet but not really be part of it

# Challenges

- Need a system that makes it feasible to locate all the machine, appliances, and sensors in the IoT
- Lack agreement and adoption of key standards and business practices around open standards

# Major Policy Issues for Consideration

- Privacy and Security
- Transparency
- International Data Flows
- Copyright
- Liability
- Antitrust
- Standards

# Back to the USA

- White House Cybersecurity strategy
- Privacy and cybersecurity legislation in Congress
- FCC Broadband plan
- FTC consideration of behavioral advertising guidelines and best practices for social media
- Dept of Commerce consideration of privacy protection and enabling innovation
- many balls in the air

# Policy Considerations

- Need to take a flexible, forward-looking approach
- Governance must be considered in a contextual setting
- No “one-size fits all”
- Global considerations, a focus on interoperability may be more useful than harmonization
  - it is easier to find ways for systems and regulatory policies to work together short of mandating identical regulatory approaches

# Policy Considerations

- IoT is too undefined and adoption too slow to commit its future parameters to a concrete control model
- Premature to base decisions on considerations of control that go beyond the concern for a technologically optimal governance structure

# A Few Cautions

- Parallels may appear to exist between the Internet and the IoT, borrowing concepts from Internet Governance discussions (i.e. “control” issues)
  - However, applying them to the IoT may not achieve desired results given the different network nature and needs
- Premature policy-making may result in misplaced emphasis on certain technological aspects which may become less critical over time or hinder future innovation

# Bottom Line for Policy-Makers

- Governance must support innovation, economic growth, and a globally interoperable platform



# Conclusion

- The IoT must be seen as a vision where "things", especially everyday objects
  - home appliances, furniture, vehicles, roads and smart materials
  - readable, recognizable, locatable, addressable and/or controllable via the Internet
- This vision will surely change with time, especially as synergies between Identification Technologies, Wireless Sensor Networks, Intelligent Devices and Nanotechnology will enable a number of advanced applications and societal benefits
- The Internet will continue to go through many transformations

# Thank you

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